

**Additional File 7: Repeat-based alignment of the encoded amino acid sequences.** Only the second exon alignment is shown; the leader alignment is identical to that shown in Additional File 3. Element borders are indicated by vertical black lines, and are labeled above the sequence. Repeats are indicated by shaded boxes, which each different color (red = type 1; blue = type 2; green = type 3; yellow = type 4; and purple = type 5).



## Repeat 1.1

## Repeat 1.2

### Repeat 1.3

## Repeat 1.4

	Er7	Er8	Er9	Er10	Er11	Er12	Er13	Er14	Er15	Er16	Er17	Er18	Er19	Er20	Er21...			
	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360
2-05																		RP 223
2-06																		RP 195
2-07																		RP 223
2-08																		RP 223
2-09																		RP 195
2-11																		RP 186
2-12																		RP 186
2-15																		RP 186
2-17																		RP 186
2-18																		RP 223
2-20																		RP 186
2-21																		RP 223
2-24																		RP 223
2-25																		RP 186
2-28																		RP 223
2-34	HHQAGRPFFGNPPPFPNPEQEP																	HDHPMPFEMRPFRFNPLGRKPGDHFPCRNHTEGHCDPHRHHSKTVDDQDTGHHGGHGHHEHHHHQDHREGHQDHDRPMFGMPC 338
2-35																		186
2-36	HHQAGRPFFGNPPPFPNPEQEP																	HDHPMPFEMRPFRFNPLGRKPGDHFPCRNHTEGHCDPHRHHSKTVDDQDTGHHGGHGHHEHHHHQDHREGHQDHDRPMFGMPC 338
2-37																		186
2-38																		RP 223
2-47																		186
2-50																		130
2-52																		RP 223
2-55																		HDHPMPFEMRPFRFNPLGRKPGDHFPCRNHTEGHCDPHRHHSKTVDDQDTGHHGGHGHHEHHHHQDHREGHQDHDRPMFGMPC 201
2-56																		RP 223
2-57																		RP 223
2-59																		130
2-61																		211
2-63																		186
2-64																		RP 223
2-65																		130
2-66																		RP 195
2-67																		186
2-73																		186
2-76																		RP 223
2-77																		RP 223
2-79																		RP 223
2-82																		RP 223
2-84																		130
2-90																		186
2-91																		186
2-95																		186
2-102																		RP 223
2-103																		RP 195
2-105																		186
2-106																		RP 223
2-107																		186
2-109																		RP 223
2-111																		RP 223
2-115																		RP 223
2-116																		130
2-118																		186
2-119																		186
4-150																		RP 223
4-150																		130
4-151																		RP 223
4-151																		RP 223
4-151																		RP 200
4-151																		130
4-152																		186
4-152																		RP 201
4-152																		223
4-152																		211
4-153																		RP 223
4-153																		186
4-153																		186
4-153																		201
4-153																		130
4-153																		198
4-153																		RP 223
4-154																		186
4-154																		RP 223
4-154																		RP 200

Repeat 2.1

Repeat 4.1

Repeat 3.1

Repeat 2.2 Repeat 5.1

Repeat 2.3

Repeat 4.2...

Sequence alignment diagram showing repeats across Er7 to Er21. The diagram uses color-coded boxes to highlight sequence segments: blue for Repeat 2.1, orange for Repeat 4.1, purple for Repeat 2.2, green for Repeat 3.1, pink for Repeat 5.1, yellow for Repeat 2.3, and red for Repeat 4.2.

Repeat	Color
Repeat 2.1	Blue
Repeat 4.1	Orange
Repeat 2.2	Purple
Repeat 3.1	Green
Repeat 5.1	Pink
Repeat 2.3	Yellow
Repeat 4.2	Red

...Repeat 4.2 Repeat 2.4    Repeat 5.2    Repeat 4.3

### Repeat 3.2

...Er21	Er22	Er23	Er24	Er25	Er26	Er27a	Er27b						
	370	380	390	400	410	420	430	440	450	460	470	480	490
4-154	FRFNHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFESRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	364							
4-154		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
4-154	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESITSSPFEVVEIAVNNEEDVNVAEV*	330							
4-155				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	292							
4-241	FRYNHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
4-241	FYNYHF	RKPFGDRPFGRNHTEVHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
4-241	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESITSSPFEVVEIAVNNEEDVNVAEV*	330							
4-244	FRYNHF	RKPFGDRPFGRNHTEVHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
10-01	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-02	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-03		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGQRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-04	FYNYHF	RKPFGDRT	GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	335							
10-06	FYNYHF	RKPFGDRTF	GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAFNNEEDDVHVAEV*	296							
10-07				HPRHNNKTRDG	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPHPHGNRGRWGENESEEKEHPTTESVTTSSPLKIEIAINAEVDVNVAEV*	476							
10-10	FRFNHF	RKPFGDRH	GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAFNNEEDVNVAEV*	328							
10-11	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	328							
10-13				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	337							
10-14	FYNYHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
10-15	FYNYHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
10-17	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-18				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAFNNEEDVNVAEV*	296							
10-19	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	353							
10-20				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPHGNRGRWGENESEEKEHPTTESVTTYSPP*VVEIAVNNEEDINGVAEV*	292							
10-21	FYNYHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
10-22	FYNYHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVE~AINNEEDVNVAEV*	360							
10-24	FYNYHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	362							
10-25		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-26				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTYSPP*VVEIAVNNEEDINGVAEV*	292							
10-28		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-29		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-30		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-31	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-32		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-35	FRFNHF	RKPFGGR	GRFNHTEGHQ	GHNETGD	DODRPMFESRPFRNPYCRKPFGDRLPGRRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPPEVVEIAFNNEEDVNVAEV*	339							
10-37	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258								
10-38				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-39				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-40	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	326							
10-42	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-43	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-46		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-50	FRFNHF	RKPFGGRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFESRPFRNPYCRKPFGDRLPGRRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAFNNEEDVNVAEV*	339							
10-51	FRFNHF		GRFNHTEGHQ	GHNETGD	DODRPMFETRPFWVNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	330							
10-52		RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAINX~~~XVAEV*	258							
10-54				HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGQRPHGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAFNNEEDVNVAEV*	296							
10-55	FYNYHF	RKPFGDRPFGRNHTEGHQ	GHNETGD	HPRHNNKTRDG	DODRPMFEMRPFRFNPFCRKPFGRNGDGRPFGRNGTEEGSPRRDGHRPYGNRGRWGENESEEKEHPTTESVTTSSPFEVVEIAVNNEEDVNVAEV*	362							

...Repeat 4.2 Repeat 2.4 Repeat 5.2 Repeat 4.3

Repeat 3.2